Trend Study 20-1-03

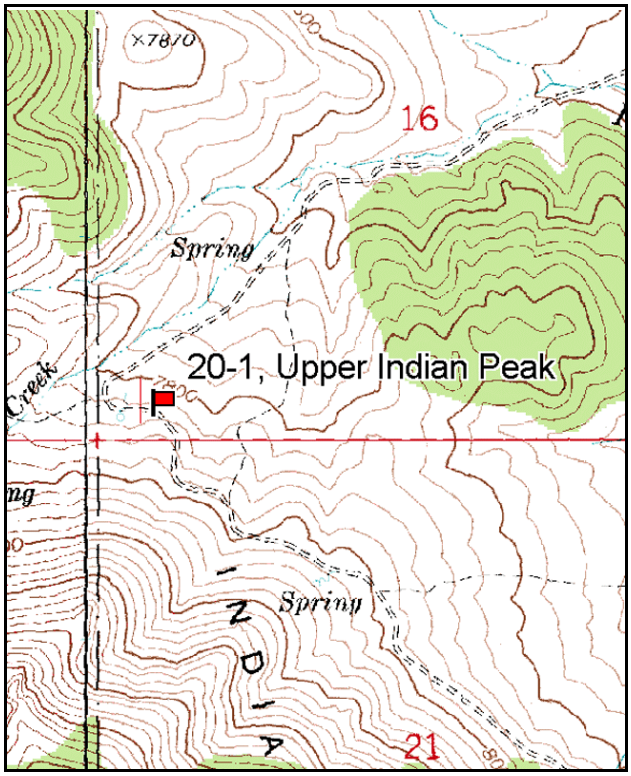
Study site name: Upper Indian Peak . Vegetation type: Mountain Brush .

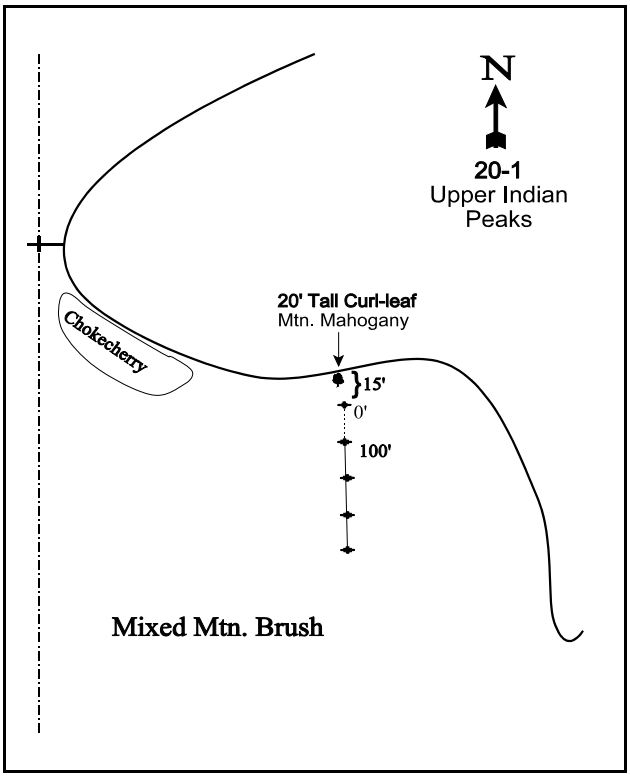
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Indian Peaks state cabin travel west 0.4 miles to a fork. Turn left and cross the stream. Turn right at the fork on the other side of the stream at 0.1 miles. Stay right at all other forks and drive 4.8 miles to a curlleaf mahogany on the west side of the road and the witness post. It is 2.4 miles from the last fork to the witness post. The 0-foot baseline stake is 15 feet south of the mahogany. The study is marked by two to three foot tall steel rebar.





Map Name: Buckhorn Spring

Diagrammatic Sketch

Township 29S , Range 18W , Section 16

GPS: NAD 27, UTM 12S 4240553 N, 248679 E

DISCUSSION

Upper Indian Peak - Trend Study No. 20-1

The Upper Indian Peak range trend study samples an area of mixed mountain brush, northeast of Indian Peak. This limited browse-shrub range type is important to the resident deer and elk herds. The site is at an elevation of 7,900 feet with a northerly aspect and a slope which varies from 20% to 30%. It is used year-round except when there is deep snow. There is ample, although low quality, winter range within the pinyon-juniper belt. Water can be limiting on these dry mountains, but there are several springs and a small perennial stream within one-quarter mile of this site.

Deer, elk, trespass cattle, and feral horses are found in the area. Pellet group data from 1991 estimated only 6 deer and 5 elk days use/acre (14 ddu/ha and 13 edu/ha). Pellet group data from 1998 estimated 8 deer and 26 elk days use/acre (20 ddu/ha and 64 edu/ha). Some trespass cattle use occurred in 1998 estimated at 4 cow days use/acre (10 cdu/ha). Data from 2003 showed increased elk use at 60 days use/acre (148 edu/ha), while deer use was estimated at only 2 days use/acre (5 ddu/ha). The allotment has been closed to livestock grazing since 1978. However, cattle continued to trespass onto DWR land until the late 1990's.

The soil varies in depth because of a rocky subsurface horizon. This rockiness effects rooting depth which averages just over 15 inches. Some loose rock fragments occur on the surface and pavement accounts for 25% to 30% of the ground surface. There is some moderate downslope movement of rocks and soil which causes pedestalling on the uphill side of shrubs and terracing of trails parallel to the slope. However, erosion is not a serious problem and vegetation and litter provide adequate ground cover to prevent most erosion.

A variety of browse species comprise the vegetative community. The most prominent browse species are both valuable and palatable forage species. These include true mountain mahogany, Utah serviceberry, and mountain big sagebrush. Other important but less abundant species include curlleaf mountain mahogany, bitterbrush, slenderbush eriogonum, and mountain snowberry. All of the palatable browse species have increased in density since the 1998 reading. The three most abundant preferred browse, mountain big sagebrush, true mountain mahogany, and serviceberry currently make up 77% of the total browse cover. Mountain big sagebrush has always provided the most cover (production) of all browse species since the site was set up in 1985. It provided 38% of the browse cover in 2003 with a cover value of 13%. The next two browse in order of abundance are still Utah serviceberry and true mountain mahogany, but have switched their order in amount of cover they provide. Utah serviceberry accounts for 24% of the browse cover, while true mountain mahogany provides an additional 15%. Preferred browse species displayed mostly light to moderate use in 1985, increasing to moderate and heavy use by 1991, 1998, and 2003, except for mountain big sagebrush which has shown mostly light to moderate use. Vigor is good overall and populations appear to be stable to improving.

The herbaceous understory in the past has been abundant and diverse. Seven perennial grasses provided 13% cover in 1998. The only abundant grass was mutton bluegrass which made up 91% of the grass cover in 1998. It was still the most abundant species in 2003, but it now makes up only 55% of the grass cover. Grass cover has decreased by 43% since 1998. Utilization of the grasses has always appeared to be light. A variety of forbs were found growing in close proximity to the shrubs, although few are within the interspaces. Cover of forbs has also decreased since 1998 by 32%. This could be due to soil condition, moisture availability or providing protection from grazing animals. Many valuable forage species are present which are very important in providing succulent summer forage. Some of the more common forbs include Indian paintbrush, Eaton fleabane, tapertip hawksbeard, dusty penstemon, and desert phlox. Paintbrush was heavily utilized in 1991 and 1998. The dry conditions in 2002 and 2003 have caused a decrease in overall herbaceous cover by two-thirds since the 1998 reading.

1985 APPARENT TREND ASSESSMENT

Signs indicate some soil movement, although erosion is not a serious problem. The increasing vegetative and litter cover will help stabilize the soil and may also aid the establishment of forbs. Density of desirable browse species appears to be increasing. Cattle grazing should be closely regulated to ensure they do not further damage the water sources and over utilize the vegetation in riparian areas which appear to be critical big game habitat.

1991 TREND ASSESSMENT

The soil trend appears slightly down but no severe erosion problems are occurring on the site. Vegetation and litter cover have increased slightly, but percent bare ground has increased from 12% to 20% since 1985. The key browse species show decreases in population densities and slight increases in decadent plants, with the exception of sagebrush which makes up half of the preferred browse. However, there are still good numbers of young and seedlings so the trend overall appears stable. Grass and forb trend is slightly up due to a large increase in nested frequency values.

TREND ASSESSMENT
soil - slightly down (2)
browse - stable (3)
herbaceous understory - slightly up (4)

1998 TREND ASSESSMENT

Trend for soil appears stable. Percent bare ground declined but litter cover also declined. However, this was compensated for by a substantial increase in vegetative cover. Some erosion is occurring but it is minimal. Trend for the key browse species, serviceberry, mountain big sagebrush, and true mountain mahogany is stable with changes in population densities primarily related to the much larger sample used in 1998. These shrubs show similar use compared to 1991, vigor is generally good, and percent decadence is low. Current reproduction appears adequate to maintain these populations. Trend for the herbaceous understory is mixed. Trend for perennial grasses is stable, but sum of nested frequency of perennial forbs has declined dramatically. Some of the difference would also be due to the larger sample. The original 100 ft frequency baseline was placed in an area with heavier cover of herbaceous plants. The new baseline is 400 feet long and stretches further up the hill where there is larger bare shrub interspaces and less forbs. The largest decline in nested frequency for forbs comes from Indian paintbrush, Eaton fleabane, longleaf and desert phlox. With this in mind, trend is considered stable.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil appears to be downward with decreases in vegetative and litter cover, and a significant increase in bare soil. Some erosion is occurring but it is minimal. Trend for the key browse species, serviceberry, mountain big sagebrush, and true mountain mahogany, which makes up 77% of the total browse cover, is stable. Trend has remained stable with slight increases in density for each of the primary species. Use on these shrubs remains similar compared to 1998, vigor is generally good, and percent decadence remains about the same. Current reproduction appears adequate to maintain these populations. Trend for the herbaceous

understory is down from 1998, with significant reductions in both grass and forb cover and sum of nested frequency. This has been a dramatic decline because of the drought. The largest decline in nested frequency for forbs comes from Indian paintbrush, Eaton fleabane, and desert phlox.

TREND ASSESSMENT
soil - down (1)
browse - stable (3)
herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 20 , Study no: 1

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	-	-	-	6	-	.01
G	Agropyron spicatum	a10	ab38	a23	b54	.26	.87
G	Koeleria cristata	1	-	6	-	.06	-
G	Leucopoa kingii	-	-	2	-	.01	-
G	Poa fendleriana	b267	b267	b265	a135	11.69	2.57
G	Poa secunda	a-	ab4	b17	c63	.55	1.25
G	Sitanion hystrix	-	-	1	-	.06	-
G	Stipa comata	-	-	3	-	.15	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		278	309	317	258	12.78	4.70
Total for Grasses		278	309	317	258	12.78	4.70
F	Achillea millefolium	1	-	3	-	.00	-
F	Agoseris glauca	a-	a-	b14	ab6	.04	.04
F	Allium spp.	a-	a-	b18	a3	.09	.00
F	Antennaria rosea	-	2	-	1	-	.00
F	Androsace septentrionalis (a)	-	-	5	-	.01	-
F	Arabis drummondi	4	6	2	2	.01	.00
F	Astragalus mollissimus	b33	b20	b18	a-	.14	-
F	Astragalus utahensis	-	-	7	-	.33	-
F	Balsamorhiza hookeri	a-	a-	b35	a-	.57	-
F	Balsamorhiza sagittata	1	3	1	4	.03	.06
F	Castilleja angustifolia	b62	c113	b66	a25	1.40	.13
F	Calochortus nuttallii	1	-	5	1	.04	.00
F	Collinsia parviflora (a)	-	-	b12	a-	.05	-
F	Crepis acuminata	ab32	c66	b39	a16	.29	.03
F	Cymopterus spp.	a-	a-	b25	b11	.32	.05
F	Delphinium nuttallianum	-	-	2	-	.00	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Erigeron eatonii	$_{b}$162	$_{b}$153	$_{a}$112	$_{a}$106	2.01	.92
F	Erigeron pumilus	3	5	3	-	.00	-
F	Eriogonum racemosum	41	35	24	18	.22	.17
F	Eriogonum umbellatum	27	40	46	28	.95	.21
F	Fritillaria atropurpurea	$_{a}$-	$_{a}$-	$_{b}$13	$_{a}$-	.05	-
F	Galium multiflorum	3	3	6	4	.18	.03
F	Lappula occidentalis (a)	-	-	3	-	.00	-
F	Lomatium spp.	$_{a}$-	$_{a}$-	$_{b}$38	$_{a}$6	.47	.01
F	Lupinus argenteus	$_{c}$42	$_{bc}$38	$_{ab}$20	$_{a}$11	.92	.72
F	Lygodesmia spinosa	-	4	-	-	-	-
F	Microsteris gracilis (a)	-	-	3	-	.00	-
F	Penstemon bridgesii	7	17	4	6	.15	.04
F	Penstemon comarrhenus	$_{ab}$21	$_{b}$22	$_{b}$20	$_{a}$2	1.24	.37
F	Phlox austromontana	$_{b}$163	$_{b}$197	$_{a}$91	$_{a}$80	4.61	3.40
F	Phlox longifolia	$_{b}$69	$_{b}$86	$_{a}$33	$_{a}$30	.15	.10
F	Senecio integerrimus	$_{a}$-	$_{a}$-	$_{b}$15	$_{b}$13	.13	.08
F	Streptanthus cordatus	4	2	7	7	.01	.07
F	Unknown forb-perennial	5	-	-	-	-	-
Total for Annual Forbs		0	0	23	0	0.08	0
Total for Perennial Forbs		681	812	667	380	14.46	6.48
Total for Forbs		681	812	690	380	14.54	6.48

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 20 , Study no: 1

Type	Species	Strip Frequency '98	Strip Frequency '03	Average Cover % '98	Average Cover % '03
B	Amelanchier utahensis	30	30	8.40	5.89
B	Artemisia tridentata vaseyana	87	86	15.96	13.22
B	Cercocarpus ledifolius	4	4	.39	1.60
B	Cercocarpus montanus	30	32	5.22	7.63
B	Chrysothamnus parryi	0	14	-	.04
B	Chrysothamnus viscidiflorus viscidiflorus	22	21	.91	1.05
B	Eriogonum microthecum	30	47	.79	1.09
B	Gutierrezia sarothrae	0	1	-	-
B	Opuntia erinacea	19	15	.22	.09
B	Pinus monophylla	2	0	-	-
B	Purshia tridentata	3	4	.68	.66
B	Symphoricarpos oreophilus	35	40	1.87	3.34
B	Tetradymia canescens	5	10	.18	-
Total for Browse		267	304	34.66	34.63

CANOPY COVER, LINE INTERCEPT --
Management unit 20 , Study no: 1

Species	Percent Cover '03
Amelanchier utahensis	11.14
Artemisia tridentata vaseyana	11.85
Cercocarpus ledifolius	1.25
Cercocarpus montanus	7.75
Chrysothamnus parryi	.43
Chrysothamnus viscidiflorus viscidiflorus	.50
Eriogonum microthecum	.43
Opuntia erinacea	.01
Purshia tridentata	1.29
Symphoricarpos oreophilus	5.03
Tetradymia canescens	.10

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 20 , Study no: 1

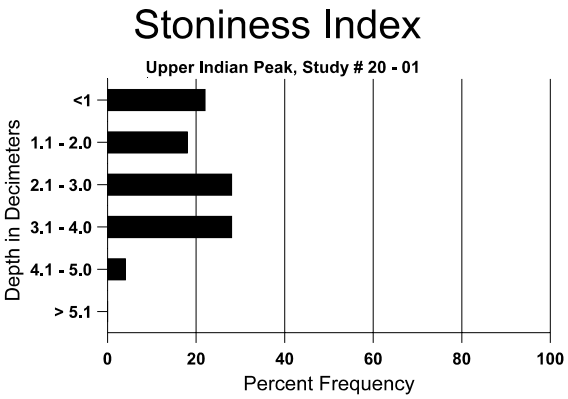
Species	Average leader growth (in) '03
Amelanchier utahensis	3.7
Cercocarpus ledifolius	3.0
Cercocarpus montanus	4.3
Purshia tridentata	3.1

BASIC COVER --
Management unit 20 , Study no: 1

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	12.50	14.50	49.77	42.25
Rock	1.00	1.75	4.53	2.73
Pavement	36.25	22.00	33.65	22.38
Litter	38.75	42.00	34.09	25.88
Cryptogams	0	0	.08	0
Bare Ground	11.50	19.75	8.10	22.10

SOIL ANALYSIS DATA --
Management unit 20, Study no: 1, Study Name: Upper Indian Peak

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
15.3	59.7 (15.6)	7.3	62.0	21.1	16.9	2.2	9.3	112.0	0.4



PELLET GROUP DATA --
Management unit 20 , Study no: 1

Type	Quadrat Frequency	
	'98	'03
Rabbit	19	-
Elk	19	24
Deer	14	3
Cattle	3	-

Days use per acre (ha)	
'98	'03
-	-
26 (64)	60 (149)
8 (20)	2 (5)
4 (10)	-

BROWSE CHARACTERISTICS --
Management unit 20 , Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
85	**1066**	133	-	1066	-	-	0	0	0	0	27/23
91	**399**	400	133	200	66	-	17	0	17	0	33/35
98	**900**	60	320	560	20	-	27	9	2	0	42/46
03	**920**	20	80	820	20	-	15	78	2	0	41/50
Artemisia tridentata vaseyana											
85	**11332**	1200	4066	6933	333	-	19	2	3	1	8/13
91	**11599**	66	1000	7933	2666	-	50	31	23	11	8/18
98	**6840**	840	1040	4920	880	240	34	13	13	3	15/23
03	**7100**	-	200	5660	1240	240	25	.28	17	3	9/17
Cercocarpus ledifolius											
85	**66**	-	66	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**100**	-	40	60	-	-	40	20	-	0	76/59
03	**100**	-	20	80	-	-	20	60	-	0	73/77
Cercocarpus montanus											
85	**1466**	333	200	1200	66	-	36	0	5	0	30/12
91	**1132**	333	200	866	66	-	41	35	6	6	31/37
98	**740**	20	140	540	60	20	46	24	8	3	43/52
03	**1040**	-	140	900	-	-	12	81	0	0	39/51
Chrysothamnus parryi											
85	**0**	-	-	-	-	-	0	0	0	0	-/-
91	**0**	-	-	-	-	-	0	0	0	0	-/-
98	**0**	-	-	-	-	-	0	0	0	0	-/-
03	**340**	-	-	320	20	-	6	24	6	0	7/10

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus											
85	**866**	-	200	600	66	-	0	0	8	0	8/6
91	**332**	-	133	133	66	-	20	0	20	0	9/11
98	**720**	20	80	520	120	20	11	0	17	0	10/14
03	**960**	-	-	900	60	-	19	4	6	0	10/12
Eriogonum microthecum											
85	**10532**	666	1733	7933	866	-	0	0	8	3	6/4
91	**7133**	733	2200	4200	733	-	10	.93	10	7	7/7
98	**1000**	120	60	900	40	-	0	2	4	0	7/10
03	**2240**	-	20	2180	40	-	4	2	2	0	7/8
Gutierrezia sarothrae											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	0	6/9
Opuntia erinacea											
85	**3399**	133	1133	2266	-	-	0	0	0	2	5/8
91	**2599**	200	733	1133	733	-	0	0	28	26	4/6
98	**440**	-	160	200	80	-	0	0	18	18	4/9
03	**420**	-	60	340	20	-	0	0	5	10	4/9
Pinus monophylla											
85	**266**	-	266	-	-	-	0	0	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	0	-/-
98	**60**	-	60	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	-/-
Purshia tridentata											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	0	-/-
98	**60**	-	-	60	-	-	0	33	-	0	11/53
03	**80**	-	-	80	-	-	25	75	-	0	11/55
Symphoricarpos oreophilus											
85	**1266**	133	666	600	-	-	0	0	0	0	10/9
91	**866**	-	533	333	-	-	15	0	0	0	12/22
98	**1420**	60	400	1020	-	-	3	0	0	0	12/22
03	**1900**	-	220	1620	60	-	8	0	3	2	11/22

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Tetradymia canescens											
85	**533**	133	-	333	200	-	0	0	38	13	10/6
91	**399**	66	133	-	266	-	0	0	67	50	-/-
98	**100**	-	-	80	20	-	0	0	20	0	12/13
03	**320**	-	40	240	40	-	19	0	13	0	12/16